Name _____

Protein Synthesis Manipulatives

Deoxyribonucleic acid (DNA) carries inherited genetic information in the coded sequence of its nitrogenous bases. For this code to be changed into the metabolic processes of a living organism, the DNA sequence is *transcribed* to the nucleotide sequence of a messenger ribonucleic acid (mRNA) molecule through a process called ***transcription***. Three mRNA nucleotides (a ***codon***) code for one specific amino acid. The sequence of mRNA codons is *translated* into chains of the 20 different amino acids at the ribosomes by transfer RNA (tRNA) through a process called ***translation***. Each ***anticodon*** loop made of three tRNA nucleotides attaches to a specific amino acid. These amino acid chains constitute proteins that catalyze the biochemical reactions of living organisms.

DNA → DNA = replication (occurs in nucleus)
DNA → RNA = transcription (occurs in nucleus)
RNA → Protein = translation (occurs at ribosome)

Model Together:

DNA Replication

DNA 3' T A C T A G G T C C A T A T C 5'
DNA 5' 3'

Transcription

DNA Sense Strand 3' T A C T A G G T C C A T A T C 5'
mRNA 5' 3'

Translation

mRNA codons __ __ __, __ __ __, __ __ __, __ __ __, __ __ __
tRNA anticodons __ __ __, __ __ __, __ __ __, __ __ __, __ __ __
amino acids _____ _____ _____ _____ _____

Now You Try:

1. DNA Replication:
Using the pre-printed bases on the sense strand of DNA, use a dry erase marker to record the complementary DNA bases on the pink nonsense strand of DNA.

2. Transcription:
Using the pre-printed bases on the sense strand of DNA, use a dry erase marker to record the complementary mRNA codons on the green mRNA strand.

3. Translation:
Using your mRNA codons on the green mRNA strand

- Record the complementary tRNA anticodons on the black and white tRNA molecules.
- Use your decoder to record the correct amino acids on the yellow polypeptide (protein).

4. Checking your work:
When you are finished, raise your hand and have Mrs. Amos check your sequences. If you are correct, she will initial the appropriate box below and give you a new DNA strand. Then repeat Parts 1-4.

DNA #1 ☐ DNA #2 ☐ DNA #3 ☐ DNA #4 ☐

5. Vocab Review:
Finally, review the process used to create your protein by answering the following questions. (See the bolded words on the first page for clues.)

1. The process whereby mRNA is manufactured from DNA is called _____.

2. The assembly of an amino acid chain according the sequence of base triplets in a molecule of mRNA is called _____.

3. A continuous triplet of mRNA that specifies a particular amino acid is called a/an _____.

4. A three-base sequence on one loop of a tRNA molecule (that is complementary to the mRNA triplet), which joins the appropriate amino acid and its mRNA is called a/an _____.